



## Research Summaries for Normal Birth

Compiled by Amy M. Romano, MSN, CNM

### ABSTRACT

In this column, the author presents summaries of four research studies that further illuminate the physiology and benefits of normal birth. The topics of the studies address cesarean section following elective induction, epidural use, the effects of inadequate sleep during late pregnancy, and the immune properties of amniotic fluid and vernix caseosa.

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**Keywords:** cesarean birth, epidurals, sleep patterns in pregnancy, amniotic fluid, vernix caseosa, normal birth

### INTRODUCTION

New research continues to illuminate the physiology and benefits of normal birth. The Lamaze Institute for Normal Birth promotes evidence-based maternity care, including the Six Care Practices that Support Normal Birth. To access more research summaries and other important resources, visit the Lamaze Institute for Normal Birth online.

### RISK OF CESAREAN SECTION FOLLOWING ELECTIVE INDUCTION IS INFLUENCED BY CHOICE OF PHYSICIAN

- Luthy, D. A., Malmgren, J. A., & Zingheim, R. W. (2004). Cesarean delivery after elective induction in nulliparous women: The physician effect. *American Journal of Obstetrics and Gynecology*, 191(5), 1511–1515.


#### Summary

This retrospective cohort study evaluated the contribution of the individual physician to the risk of

cesarean following elective induction of labor in nulliparous women. The researchers reviewed all births at a large, multispecialty hospital system from January 1999 through December 2000 and identified, through chart review, all spontaneous labors and elective inductions in nulliparous women with singleton fetuses in the cephalic (head-down) position who planned vaginal delivery ( $n = 3215$ ).

The researchers developed a risk model that analyzed the individual and combined effects of factors known to affect the risk for cesarean following elective induction, including maternal demographics, birth weight, obstetric conditions, and labor characteristics. After adjusting for these factors, the risk model was applied with medical practice type (maternal-fetal medicine, obstetrics, family physician) and the individual physician included. This resulted in a model that measured the “physician effect” on cesarean risk.

The researchers found that the individual physician was a significant contributing factor to the risk of cesarean birth following elective induction of

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labor. Incorporating the physician variable into the risk model significantly increased the odds ratio for cesarean birth from 1.78 to 2.01. In other words, the risk model more strongly predicted cesarean section when it incorporated the choice of physician. The results of this study are consistent with other large studies that have found that elective induction almost doubles the cesarean risk in first-time mothers. However, this study also shows that the increased risk may either increase further or decrease, depending on the management style and practices of the physician.

### ***Significance for Normal Birth***

In normal birth, labor begins on its own. Induction of labor increases the risk of a cesarean, especially for first-time mothers and their babies. This is why labor should only be artificially induced when a clear medical reason outweighs the risks. Elective induction of labor doubles the risk of cesarean birth in first-time mothers.

In this study, the association between elective induction and cesarean birth was found to be even stronger when the researchers adjusted for variation in physician practice. This is not surprising: Care providers can promote normalcy in birth, even in the context of artificially induced labor, by using the care practices that support normal birth. Maximizing the woman's freedom to move in labor and assume non-supine birth positions, avoiding routine interventions, allowing the woman's choice of continuous labor support, and avoiding unnecessary separation of mother and baby after delivery affect birth outcomes. When care providers disregard these fundamental care practices, the already increased risk of cesarean section following elective induction may be compounded by additional risk.

### **EVIDENCE DOES NOT SUPPORT THE COMMON PRACTICE OF LETTING EPIDURAL "WEAR OFF" LATE IN LABOR**

- Torvaldsen, S., Roberts, C. L., Bell, J. C., & Raynes-Greenow, C. H. (2004). Discontinuation of epidural analgesia late in labour for reducing the adverse delivery outcomes associated with epidural analgesia. *The Cochrane Library* (4).

### ***Summary***

This Cochrane Review evaluated the common practice of discontinuing epidural analgesia late in labor as a means of decreasing the risk of instrumental

birth or other adverse outcomes. The authors reviewed the literature and found six randomized controlled trials that met the predefined search criteria, of which one was excluded because a large proportion of the epidurals were given for medical reasons other than pain relief. A total of 462 participants were included in the five remaining trials. All were nulliparous women in labor at term with singleton fetuses in the cephalic (head-down) position. Outcomes of births where the epidural was discontinued at or after 8 centimeters of cervical dilatation were compared with those of births where the epidural was continued until the baby was born.

A meta-analysis of the data from the five studies showed that no statistically significant decrease occurred in the proportion of instrumental births between the two groups (23% vs. 28%, OR = .84, 95% CI .61–1.15). Also, no significant differences were found in the number of cesarean births, length of the second stage of labor, risk of persistent fetal malposition (posterior or transverse), or incidence of poor neonatal outcomes as measured by Apgar scores or umbilical artery pH values. However, discontinuing the epidural late in labor was associated with a statistically significant increase in inadequate pain relief, as reported by the mother. Differences in long-term outcomes such as incontinence and sexual problems and in maternal satisfaction with the birth experience were not measured in any of the studies.

The authors conclude that discontinuing epidural analgesia late in labor increases the risk of inadequate pain relief in the second stage of labor and that no evidence of benefit outweighs this risk. Larger trials are needed to determine whether a statistically or clinically significant reduction occurs in instrumental births. The authors also encourage more research on the acceptability of this practice to women and on maternal satisfaction with the birth experience.

### ***Significance for Normal Birth***

Epidural use increases the risk of instrumental (forceps or vacuum) birth in first-time mothers. Experts have proposed various reasons for this association, including the diminished urge to push and changes in the tone of the pelvic floor muscles that inhibit proper rotation of the fetal head. Letting the epidural "wear off" has been thought to increase the likelihood of unassisted vaginal birth; however, this systematic review calls into question that common practice.

In normal birth, complex hormonal shifts help labor progress and facilitate birth. The laboring

woman produces natural endorphins that help her manage the pain of labor. Her ability to move freely and assume a variety of positions while pushing work in concert with these hormonal changes. Epidural analgesia numbs the sensations of birth, and the production of natural endorphins ceases as a result of the disruption of the hormonal feedback system. When the epidural is discontinued, the woman's pain returns but her natural endorphins may remain diminished and, therefore, her pain may be greater than if the epidural had not been given. Furthermore, when an epidural is administered, the woman is usually confined to bed and attached to fetal monitors and an intravenous line. The woman and health-care provider may become accustomed to the practice of women laboring in the bed, attached to machines. When the epidural is discontinued, the restrictions on the woman's movement may persist. Under these conditions, the impact of an epidural on normal birth may likely outlast the epidural itself.

#### **INADEQUATE SLEEP LATE IN PREGNANCY MAY INCREASE RISK OF PROLONGED LABOR AND CESAREAN SECTION**

- Lee, K. A., & Gay, C. L. (2004). Sleep in late pregnancy predicts length of labor and type of delivery. *American Journal of Obstetrics and Gynecology*, 191(6), 2041–2046.

##### **Summary**

This prospective study of 131 pregnant women who were expecting their first child compares the birth outcomes of those women who had inadequate sleep during the last month of pregnancy with those who got adequate sleep. Study participants were recruited from childbirth education classes. Women who had sleep disorders, experienced prior pregnancy loss, were younger than 18 years, or worked night shifts were excluded. The participants' total amount of sleep at night (a measure of sleep quantity) and the ratio of time spent awake in bed versus the total time spent sleeping (a measure of sleep quality or sleep disruption) were measured objectively for two consecutive weeknights using a wrist actigraph. This device senses motion and records data that can be interpreted to measure time spent asleep. These objective data were combined with subjective data from the women's sleep logs that recorded bedtimes, wake times, and ratings of the quality of sleep. The participants also recorded their

perceptions of fatigue twice daily during the 48-hour study period. Data related to birth outcomes were obtained by interviews conducted with study participants within 1 month of giving birth and included information about length of labor, type of birth, and infant birth weight.

Controlling for infant birth weight, women who had severe sleep disruption (more than 15% of their sleep time awake) and those who averaged less than 6 hours of sleep per night had significantly longer labors than women with less than 10% of sleep time spent awake and those who averaged more than 6 hours of sleep per night. Women with severely disrupted sleep were 5.2 times more likely to have a cesarean than women with little or no sleep disruption. Women averaging fewer than 6 hours of sleep per night were 4.5 times more likely to have a cesarean than women who averaged at least 7 hours of sleep. Women's subjective reports of poor sleep quality were associated with their type of birth, not the duration of their labor. Women who reported having poor sleep quality 5 or more days per week were 5.3 times more likely to have a cesarean than those reporting poor sleep quality 0 to 2 nights per week. Other subjective measures of sleep quality or quantity, as well as women's reports of fatigue, were not associated with type of delivery or length of labor.

##### **Significance for Normal Birth**

This study sheds light on a risk factor for prolonged labor and cesarean birth in nulliparous women: inadequate sleep in the last month of pregnancy. Inadequate sleep may be a result of anxiety or increased stress hormones, both of which have been shown to correlate with poor obstetric outcomes. Women who lack rest late in pregnancy may also be left without the reserves of energy they need to meet the physical challenges of labor.

As health-care professionals learn more about the physiological and psychological changes that prepare women for labor, they may be able to suggest interventions to help women maximize their chances for normal births. The authors encourage care providers to question pregnant women about their sleep habits and prescribe bedtimes and wake times for women who average fewer than 6 hours of sleep per night. This advice is difficult for many women to heed and does not address the root cause of disrupted or inadequate sleep in pregnant women. A pregnant woman's anxiety, especially related to her upcoming labor and birth, may be addressed through anticipatory guidance

and confidence-building exercises. Teaching guided relaxation techniques may also help to alleviate sleep problems. Finally, care providers should inquire about other sources of disrupted sleep, such as musculoskeletal pain or psychosocial factors, and provide treatment or referrals, as needed.

#### ANTIMICROBIAL PROPERTIES OF AMNIOTIC FLUID AND VERNIX CASEOSA ARE SIMILAR TO THOSE FOUND IN BREAST MILK

- Akinbi, H. T., Narendran, V., Pass, A. K., Markart, P., & Hoath, S. B. (2004). Host defense proteins in vernix caseosa and amniotic fluid. *American Journal of Obstetrics and Gynecology*, 191(6), 2090–2096.

##### Summary

In this study, researchers analyzed samples of amniotic fluid and vernix caseosa (vernix) from healthy, term gestations to determine the immune properties of these substances. Participants were pregnant women admitted for elective cesarean section after 37 weeks gestation with no prior labor and no signs of chorioamnionitis (intrauterine infection). Women with a history of prenatal fever or premature rupture of membranes, or who received steroids prenatally or antibiotics while giving birth were excluded, as were women whose babies passed meconium in utero, had congenital malformations, or required prolonged resuscitation after birth. Amniotic fluid was obtained by amniocentesis to determine fetal lung maturity prior to elective birth. Vernix was gently scraped from the newborn's skin with a sterile implement immediately following birth. The researchers obtained 10 samples of amniotic fluid and 25 samples of vernix.

Tests (Western analysis and immunochemistry) revealed that lysozyme, lactoferrin, human neutrophil peptides 1–3, and secretory leukocyte protease inhibitor were present in the amniotic fluid samples and in organized granules embedded in the vernix samples. These immune substances were tested using antimicrobial growth inhibition assays and found to be effective in inhibiting the growth of common perinatal pathogens, including group *B. Streptococcus*, *K. pneumoniae*, *L. monocytogenes*, *C. albicans*, and *E. coli*.

The authors point out that the innate immune proteins found in vernix and amniotic fluid are

similar to those found in breast milk. As the baby prepares for extrauterine life, pulmonary surfactant (a substance produced by the maturing fetal lungs) increases in the amniotic fluid, resulting in the detachment of vernix from the skin. The vernix mixes with the amniotic fluid and is swallowed by the growing fetus. Given the antimicrobial properties of this mixture, the authors conclude that there is “considerable functional and structural synergism between the prenatal biology of vernix caseosa and the postnatal biology of breast milk” (p. 2095). They also suggest that better understanding of these innate host defenses may prove useful in preventing and treating intrauterine infection.

##### Significance for Normal Birth

Routine artificial rupture of membranes increases the likelihood of intrauterine infection because it eliminates the physical barrier (the amniotic sac) between the baby and the mother's vaginal flora. This study suggests an additional mechanism for the prevention of infection when the membranes remain intact: A baby bathed in amniotic fluid benefits from antimicrobial proteins that are found in the fluid and in vernix caseosa.

The results of this study also call into question the routine use of some newborn procedures. Early bathing of the baby removes vernix, which contains antimicrobial proteins that are active against group *B. streptococcus* and *E. coli*. Delaying the bath and keeping the newborn together with his or her mother until breastfeeding is established may prevent some cases of devastating infections caused by these bacteria. The fact that preterm babies tend to have more vernix than babies born at or after 40 weeks might mean that healthy, stable preterm babies derive even greater benefit from staying with their mothers during the immediate newborn period.

Finally, this study illustrates how the normal physiology of pregnancy and fetal development is part of a continuum that extends beyond birth to the newborn period. The immunologic similarities between amniotic fluid, vernix, and breast milk provide further evidence that successful initiation of breastfeeding is a critical part of the process of normal birth.

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AMY ROMANO is a certified-nurse midwife who cares for women and their families in a freestanding birth center in Wilmington, Delaware. She is also the Web site editor of the Lamaze Institute for Normal Birth ([www.normalbirth.lamaze.org](http://www.normalbirth.lamaze.org)).